NARSTO EPA_SS_FRESNO Elemental Carbon in 2.5 um Aerosol Fraction

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1. Data Set Description:

This data set contains the measurements taken with a single and dual wavelength aethalometer. The single wavelength aethalometer (model AE14) was operated at the Fresno supersite from December 17, 1999 to September 27, 2002. This instrument used a broad spectrum incandescent lamp to illuminate the collected aerosol. Aerosol samples were collected for five minute periods. The air sample was collected through a sharp cut size-selective cyclone to limit the size of particles to aerodynamic diameters of 2.5 µm and less. A single concentration of black carbon was determined for each five minute period.

A dual-wavelength aethalometer (model AE21)operated at the Fresno supersite from February 25, 2003 to December 31, 2006. The collected aerosol sample is illuminated with light from two light emitting diodes at wavelengths of 370 and 880 nm. Aerosol samples are collected for five minute periods. The air sample is collected through a sharp cut size-selective cyclone to limit the size of particles to aerodynamic diameters of 2.5 µm and less. The concentration of black carbon corresponds to the 880 nm measurement. The black carbon equivalent at the ultraviolet wavelength was also determined.

The Magee Scientific AethalometerTM measures the attenuation of a beam of light that is transmitted through a quartz fiber filter during the collection of an aerosol sample. The rate of attenuation is proportional to the rate of increase of optically absorbing material on the filter, which is proportional to the concentration of the absorbing material in the sampled air stream. The optical properties of the quartz filter minimize the scattering of light by the aerosol so that the attenuation is mainly due to absorption. The absorption of longer wavelengths of light is dominated by black carbon, a graphitic form of carbon. Black carbon has a broad absorption spectrum, which is inversely proportionally to the wavelength of the incident light. At shorter wavelengths of light, other carbonaceous species also absorb the incident light but in a species dependent manner. The optical absorption measurement method on quartz fiber filters has been calibrated empirically against a chemical determination of black carbon by solvent extraction pretreatment followed by thermal evolved gas analysis. This empirical calibration constant is applied to the attenuation measured by the aethalometer to determine the amount of black carbon in the collected aerosol sample. A mass flow meter measures the flow rate during sample collection to obtain the flow rate at the standard conditions of 20 °C and one atmosphere. The concentration of black carbon is calculated from the amount of black carbon, the flow rate and time of the collected air sample.

The **Fresno Supersite** is one of several Supersites that was established in urban areas within the United States by the U.S. Environmental Protection Agency (EPA) to better understand the measurement, sources, and health effects of suspended particulate matter (PM). The site is located at 3425 First St., approximately 1 km north of the downtown commercial district. First Street is a four-lane artery with moderate traffic levels. Commercial establishments, office buildings, churches, and schools are located north and south of the monitor. Medium-density single-family homes and some apartments are located in the blocks to the east and west of First Street. The Fresno Supersite began operation in May of 1999 and continues today. More information can be found in the Quality Assurance Project Plan (PDF)..

The U.S. EPA Particulate Matter (PM) Supersites Program was an ambient air monitoring research program from 1999-2004 designed to provide information of value to the atmospheric sciences, and human health and exposure research communities. Eight geographically diverse projects were chosen to specifically address these EPA research priorities: (1) to characterize PM, its constituents, precursors, co-pollutants, atmospheric transport, and its source categories that affect the PM in any region; (2) to address the research questions and scientific uncertainties about PM source-receptor and exposure-health effects relationships; and (3) to compare and evaluate different methods of characterizing PM including testing new and emerging measurement methods. Data collected by these projects are publicly available at the NARSTO Permanent Data Archive, NASA Langley DAAC. Data users should acknowledge the U.S. EPA Particulate Matter (PM) Supersites Program and the project investigator(s) listed below.

The data set should be cited as follows:
Watson, John G. and Judith C. Chow. 2003. NARSTO EPA_SS_FRESNO Elemental Carbon in 2.5 um Aerosol Fraction. Available on-line via NARSTO Data and Informaton at the Atmospheric Science Data Center at NASA Langley Research Center, Hampton, Virginia, U.S.A.

2. Sample Data Record/Data Format:

Data files are in the NARSTO Data Exchange Standard (DES) format that is described in detail on the NARSTO Quality Systems Science Center (QSSC) web site. The files follow a tabular layout and are stored as ASCII comma-separated values files (.csv). The DES does not rely on row position to identify specific information, but uses a tag to describe the information contained in the row. The DES is a self-documenting format with three main sections: the header contains information about the contents of the file and the data originator; the middle section contains metadata tables scribe/define sites, flags, and other codified fields; and the final section is the main data table that contains key sampling and analysis information and the data values. Descriptions of the standardized metadata fields are also available on the QSSC web site.

Time-Series Plots

Time-series plots are included for all of the numeric variables in each of the data files. These plots are useful for screening for outliers and visualization of values less than the detection limit and values with other quality flags. Please note that some but not all of the plots were visually examined for possible outliers and other issues. Links to the plots for each data file are included in the following table.

Data File	QC Level (Efffective Date)	Links to Time-Series Plots (PDF)
NARSTO_EPA_SS_FRESNO_AE-880-5MIN_19991217_20000630_V1.csv	1 (20030911)	View 19991217_20000630
NARSTO_EPA_SS_FRESNO_AE-880-5MIN_20000701_20001231_V1.csv	1 (20030911)	View 20000701_20001231
NARSTO_EPA_SS_FRESNO_AE-880-5MIN_20010101_20010630_V1.csv	1 (20030911)	View 20010101_20010630
NARSTO_EPA_SS_FRESNO_AE-880-5MIN_20010701_20011231_V1.csv	1 (20030911)	View 20010701_20011231
NARSTO_EPA_SS_FRESNO_AE-880-5MIN_20020101_20020630_V1.csv	1 (20030911)	View 20020101_20020630
NARSTO_EPA_SS_FRESNO_AE-880-5MIN_20020701_20020927_V1.csv	1 (20030911)	View 20020701_20020927
NARSTO_EPA_SS_FRESNO_AE-DUAL-5MIN_20030225_20030331_V1.csv	1 (20030911)	View 20030225_20030331
NARSTO_EPA_SS_FRESNO_AE-DUAL-5MIN_20030401_20030630_V1.csv	1 (20030911)	View 20030401_20030630
NARSTO_EPA_SS_FRESNO_AE-DUAL-5MIN_20030701_20030930_V1.csv	1 (20070911)	View 20030701_20030930
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20031001_20031231_V1.csv	1 (20070911)	View 20031001_20031231
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20040101_20040630_V1.csv	1 (20070911)	View 20040101_20040630
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20040701_20041231_V1.csv	1 (20071106)	View 20040701_20041231
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20050101_20050630_V1.csv	1 (20071106)	View 20050101_20050630
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20050701_20051231_V1.csv	1 (20071106)	View 20050701_20051231
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20060101_20060630_V1.csv	1 (20071106)	View 20060101_20060630
NARSTO_EPA_SS_FRESNO_AE-DUAL_5MIN_20060701_20061231_V1.csv	1 (20071106)	View 20060701_20061231

3. References:

- Watson, J.G.; Chow, J.C.; Bowen, J.L.; Lowenthal, D.H.; Hering, S.V.; Ouchida, P.; Oslund, W. Air quality measurements from the Fresno supersite; JAWMA 2000, 50(8), 1321-1334.
- Watson, J.G.; Chow, J.C. Comparison and evaluation of in-situ and filter carbon measurements at the Fresno Supersite; J. Geophys. Res. 2002, 107(D21), ICC 3-1-ICC 3-15, doi: 10.1029/2001JD000573.
- Watson, J.G.; Chow, J.C.; Hering, S.V.; Fitz, D.R. Final report for Phase I of Fresno supersite measurements; prepared for Cooperative Institute for Atmospheric Sciences and Terrestrial Applications, Las Vegas, NV, by Desert Research Institute: Reno, NV,

2002.

- Watson, J.G.; Chow, J.C.; Lowenthal, D.H.; Stolzenburg, M.R.; Kreisberg, N.M.; Hering, S.V. Particle size relationships at the Fresno supersite; JAWMA 2002, 52(7), 822-827.
- Watson, J.G.; Chow, J.C.; Fitz, D.R. Quality assurance project plan - Fresno Supersite (Revision 0); prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, by Desert Research Institute: Reno, NV, 2000.
- Watson, J.G.; Chow, J.C. Zone of representation for the Fresno, CA supersite; JAWMA 2002, in preparation.
- Watson, J.G.; Chow, J.C. A wintertime PM2.5 episode at the Fresno, CA, supersite; Atmos. Environ. 2002, 36(3), 465-475.

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Data Center:

The User and Data Services Office at the Langley Atmospheric Science Data Center is involved throughout the system to monitor the quality of data on ingest, to ensure prompt replies to user questions, to verify media orders prior to filling them, and to ensure that the needs of the users are being met.

If you have a problem finding what you need, trouble accessing the system, or need an answer to a question concerning the data or how to obtain data, please contact the User and Data Services staff.

Telephone: (757) 864-8656
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URL: http://eosweb.larc.nasa.gov

5. Acknowledgement:

When data from the Langley Atmospheric Science Data Center are used in a publication, we request the following acknowledgment be included: "These data were obtained from the NASA Langley Research Center Atmospheric Science Data Center".

The Langley Data Center requests a reprint of any published papers or reports or a brief description of other uses (e.g., posters, oral presentations, etc.) of data that we have distributed. This will help us determine the use of data that we distribute, which is helpful in optimizing product development. It also helps us to keep our product-related references current.

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